

# Study shows animals with larger brains are best problem solvers

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A spotted hyena investigates a puzzle box after an experimental trial that showed carnivore species with larger brains relative to their body size are better at solving problems. Credit: Sarah Benson-Amram

Why did some species, such as humans and dolphins, evolve large brains relative to the size of their bodies? Why did others, such as blue whales

and hippos, evolve to have brains that, compared to their bodies, are relatively puny?

It has long been thought that [species](#) with brains that are large relative to their body are more intelligent. Despite decades of research, the idea that relative brain size predicts cognitive abilities remains highly controversial, because there is still little experimental evidence to support it. However, a paper released today describes a massive experiment that supports the theory.

Sarah Benson-Amram, an assistant professor in the Department of Zoology and Physiology at the University of Wyoming, is the lead author on a new paper, titled "Brain size predicts problem-solving ability in mammalian carnivores." It shows that carnivore species with larger brains relative to their body size are better at solving a novel problem-solving task. The paper appears in the *Proceedings of the National Academy of Sciences*, one of the world's most prestigious scientific journals.

Other authors of the study include Kay Holekamp, a University Distinguished Professor at Michigan State University; Ben Dantzer, an assistant professor at the University of Michigan; Eli Swanson, a postdoctoral researcher at the University of Minnesota; and Greg Stricker, also from Michigan State University.

The authors traveled around the country to nine different zoos and presented 140 animals from 39 different mammalian carnivore species with a novel problem-solving task. The study included polar bears, arctic foxes, tigers, river otters, wolves, spotted hyenas and some rare, exotic species such as binturongs, snow leopards and wolverines. Each animal was given 30 minutes to try to extract food from a closed metal box. To access the food, an animal had to slide a bolt latch, which would allow a door to open. The box was baited with the favorite food of the study

animal, so red pandas received bamboo and [snow leopards](#) got steak.

The main result is that species with larger brains relative to their body size were more successful than species with relatively smaller brains.

"This study offers a rare look at problem solving in carnivores, and the results provide important support for the claim that brain size reflects an animal's problem-solving abilities—and enhance our understanding of why larger brains evolved in some species," Benson-Amram says.

Dantzer explains that, "Overall, 35 percent of animals (49 individuals from 23 species) were successful in solving the problem. The bears were the most successful, solving the problem almost 70 percent of the time. Meerkats and mongooses were the least successful, with no individuals from their species solving the problem."

Interestingly, larger animals were less successful overall than smaller-bodied animals. The paper also reports that manual dexterity did not affect problem-solving success.

In addition to examining the influence of [brain size](#) on problem-solving abilities, the authors also asked whether species that live in larger average group sizes are more successful problem solvers.

Holekamp explains, "A hypothesis that has garnered much support in primate studies is 'the [social brain](#) hypothesis,' which proposes that larger brains evolved to deal with challenges in the social domain. This hypothesis posits that intelligence evolved to enable animals to anticipate, respond to and, perhaps, even manipulate the actions of others in their social groups. If the social brain hypothesis is correct, then we would expect that species that live in larger social groups would be more intelligent. However, we did not find any support for the social brain hypothesis in this study. There was no indication that social group

size influenced problem-solving abilities."

**More information:** Brain size predicts problem-solving ability in mammalian carnivores, *PNAS*,

[www.pnas.org/cgi/doi/10.1073/pnas.1505913113](http://www.pnas.org/cgi/doi/10.1073/pnas.1505913113)

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